

U.S. PATENT APPLICATION
for
TAMPER RESISTANT CONTAINER

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TAMPER RESISTANT CONTAINER

BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to the field of containers. More particularly, the present invention relates to containers having features to inhibit tampering and provide a visual indication when tampering has occurred.

[0002] The consumer products industry is constantly adapting containers for consumable products, such as ready-to-eat food items, in response to the increasingly sophisticated demands of consumers. For example, consumers increasingly desire food products that can be consumed at a time and location of the consumer's choosing, while maintaining high standards of quality, for example with respect to taste, aroma, wholesomeness, texture, temperature, and appearance. In a variety of industries, including but not limited to the food service industry, consumers demand packaging that is easily transportable, and adapted to help maintain high standards of quality appropriate for the products contained in the packaging.

[0003] Products can be displayed for sale in a location directly accessible to consumers, or in a location accessible only to store service personnel. For example, products such as ready-to-eat foods in containers (deli sandwiches, baked goods, box lunches, prepared salads, etc.) may be directly accessible to consumers in an open refrigerated display case, on shelves, or on a display table. Alternatively, such products can be displayed behind glass at a service counter staffed by deli clerks, where the products cannot be directly accessed by consumers.

[0004] A number of benefits can be obtained by enabling direct access by consumers to containers containing products such as ready-

to-eat foods. Direct access gives prospective purchasers maximum exposure to the containers containing the products being sold, increasing the likelihood of a purchase. Direct access allows convenient inspection of the products by prospective purchasers, increasing consumer choice and satisfaction. Direct access can also reduce labor costs, for example the labor cost required to staff a deli service counter, and may reduce the possibility of lost sales when a prospective purchaser must wait too long for service.

[0005] While direct access by consumers may have a number of benefits, as discussed above, there can also be problems associated with direct access. Persons may sample portions of the product, such as a ready-to-eat food product, without paying for the product, leaving the partially consumed container on the shelf, to be eventually discarded by the store or purchased by an unwary consumer. Persons may deliberately tamper with or adulterate the product in the container, for any number of reasons including terrorism, extortion, or malice. Persons may "cherry-pick" portions of the product. Persons may increase the contents of the containers, with more of the original contents or with additional items, as a form of shoplifting. Any of these problems could harm consumers, and/or cause financial losses, liability, or unfavorable publicity for the food service industry.

[0006] Thermoformed plastic containers are well known as containers for the sale of products, including but not limited to ready-to-eat foods. In the thermoforming or vacuum forming process for producing plastic articles, a section of a sheet or web of thermoplastic is heated to soften it, then the sheet is drawn into a mold by a vacuum, to assume the form of the mold before the sheet cools and hardens. Generally, multiple individual plastic parts can be formed in this manner, such as the common "clamshell" plastic containers. The plastic containers can be sized and shaped to hold a wide variety of products. Additionally, the containers can be decoratively embossed.

[0007] The thermoformed plastic containers generally include a base and a cover that together form a chamber. A consumable product,

such as a ready-to-eat food, can be placed within the chamber formed by the base and cover. The cover typically attaches to the base using an interference fit to hold the cover onto the base. Tabs can also be used to hold the cover on the base. However, thermoformed plastic containers are often pliable and the interference fit or tab connection can fail during storage or transportation of the container. Failure of the interference fit or tab connection can cause the container to open, thereby spilling or damaging the contents of the container.

[0008] In containers of this type, it is often possible to remove the cover from the base, access the contents of the container, and then replace the cover leaving no evidence that the container has been opened. As a result, a subsequent consumer of the product may not know that a portion of the product has been removed, or that the food product has been contaminated intentionally or inadvertently.

[0009] Permanently sealed plastic packages can be difficult to open, and may require a sharp object such as a knife or scissors to open the package. Such permanently sealed packages may be particularly inadequate when ready-to-eat food items are the items placed within the container, since the consumer may desire to consume the food item in a location where a knife or scissors is unavailable. Further, in working to open the package, the package may be turned in several directions allowing the food item to disperse within the container and to spill the contents when the package is finally opened.

[0010] For these reasons, it can be seen that consumers and sellers of products prefer direct access by consumers to packaged products, such as ready-to-eat food products, that are displayed for sale, but that this direct access comes at some risk of various forms of tampering with those packaged products. What is needed is a container that includes features to inhibit and/or identify tampering. Such a container would preferably also be easily transportable, cost effective, easy to use by consumers and vendors

such as the food industry, resealable, and adapted to maintain the qualities of the products placed in the container, such as taste, appearance, etc.

SUMMARY OF THE INVENTION

[0011] A preferred embodiment of a container according to the invention includes a base and cover formed of thermoformed plastic, the base and cover each including a tamper evident lock portion with a crushable dimple; wherein the crushable dimple of the base tamper evident lock portion and the crushable dimple of the cover tamper evident lock portion are adapted to be nested together and crushed to form a sealed tamper evident lock.

[0012] According to another aspect of the invention, a preferred embodiment of a container according to the invention includes a base and cover each formed of thermoformed plastic and having side walls and rims, the base and cover each including one or more sealing threads integrally formed with the side walls and having engagement walls; wherein the cover and the base are formed to be placed in a first position in which the base rim engages with the cover rim but the base sealing thread engagement wall does not engage with the cover sealing thread engagement wall, and in a second position in which the base rim engages with the cover rim and the base sealing thread engagement wall engages with the cover sealing thread engagement wall, whereby the cover can be placed on the base in the first position and then moved to the second position to fasten the cover to the base.

[0013] An alternative embodiment of a container according to the invention includes a base and cover formed of thermoformed plastic, the base having a floor, side walls, a base rim, and at least one base sealing slot with an engagement wall and an open end; the cover having a ceiling, side walls, a cover rim, and at least one cover sealing ridge with an engagement wall; wherein the cover sealing ridge can be inserted into the base sealing slot so that the base sealing slot engagement wall engages with the cover sealing ridge engagement wall to fasten the cover to the base.

[0014] Further objects, features and advantages of the invention will be apparent from the following detailed description when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] In the drawings:

[0016] Fig. 1 is a perspective view of the base of an exemplary container according to the invention;

[0017] Fig. 2 is a perspective view of the base of Fig. 1, rotated approximately 180 degrees;

[0018] Fig. 3 is a perspective view from above the cover of an exemplary container according to the invention;

[0019] Fig. 4 is a perspective view from below the cover of Fig. 3;

[0020] Fig. 5 is a perspective view of the cover of Fig. 3 positioned above the base of Fig. 1;

[0021] Fig. 6 is a perspective view of the cover of Fig. 3 placed on the base of Fig. 1 to form an exemplary container according to the invention, wherein the rim of the cover engages the rim of the base but the tamper evident lock base portion is not aligned with the tamper evident lock cover portion;

[0022] Fig. 7 is a perspective view of the cover of Fig. 3 placed on the base of Fig. 1 to form an exemplary container according to the invention, wherein the tamper evident lock base portion and the tamper evident lock cover portion are aligned but not engaged;

[0023] Fig. 8 is a perspective view of the cover of Fig. 3 placed on the base of Fig. 1 to form an exemplary container according to the invention, wherein the tamper evident lock base portion and the tamper evident lock cover portion are engaged but not crushed together;

[0024] Fig. 9 is a perspective view of the cover of Fig. 3 placed on the base of Fig. 1 to form an exemplary container according to the

invention, wherein the tamper evident lock base portion and the tamper evident lock cover portion are crushed together;

[0025] Fig. 10 is a perspective view of the cover of Fig. 3 placed on the base of Fig. 1 to form an exemplary container according to the invention, wherein the tamper evident lock has been separated from the container;

[0026] Fig. 11 is a perspective view from above the base of another exemplary container according to the invention;

[0027] Fig. 12 is a perspective view from below the base of Fig. 11;

[0028] Fig. 13 is a perspective view from above the cover of another exemplary container according to the invention;

[0029] Fig. 14 is a perspective view from below the cover of Fig. 13;

[0030] Fig. 15 is a perspective view of the cover of Fig. 13 positioned to be engaged with the base of Fig. 11;

[0031] Fig. 16 is a perspective view of the cover of Fig. 13 placed on the base of Fig. 11 to form another exemplary container according to the invention, wherein the tamper evident lock base portion and the tamper evident lock cover portion are engaged but not crushed together;

[0032] Fig. 17 is a perspective view of the cover of Fig. 13 placed on the base of Fig. 11 to form another exemplary container according to the invention, wherein the tamper evident lock base portion and the tamper evident lock cover portion are crushed together;

[0033] Fig. 18 is a perspective view of the cover of Fig. 13 placed on the base of Fig. 11 to form another exemplary container according to the invention, wherein the tamper evident lock has been separated from the container; and

[0034] Fig. 19 is a perspective view of an alternative container according to the invention having a base and a cover placed on the base,

wherein the tamper evident lock base portion and the tamper evident lock cover portion are engaged but not crushed together.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0035] Fig. 1 is a perspective view of the base 22 of an exemplary container 20 according to the invention. The base 22 includes a floor 30, side walls 31 integrally formed with and extending upward from the floor 30 to a side wall top 32, and a base rim 33. In the exemplary base 22, the floor 30 and side walls are approximately circular, with a base rim 33 that is also approximately circular, although this is not necessary.

[0036] The base 22 is preferably made using thermoforming methods, from a suitable thermoformable material. For example, a container for ready-to-eat foods might be formed of a thermoformable plastic such as oriented polystyrene (OPS), talc-filled polypropylene (TFPP), polypropylene (PP), high impact polystyrene (HIPS), polyethylene terephthalate (PET), amorphous PET (APET), crystalline polyethylene (CPET) polystyrene copolymer blends, styrene block copolymer blends, and the like. The material forming the base 22 is not necessarily homogeneous, but may be, for example, a laminate, co-extruded material, or multilayer material.

[0037] The base 22 includes a tamper evident lock base portion 40. The tamper evident lock base portion 40 preferably includes a lock base tab 41, a lock base fracture portion 42, and a lock base crushable dimple 44, although this is not necessary and other types of lock base portions can be used. The lock base crushable dimple 44 preferably includes a lock base dimple wall 46 and a lock base dimple central portion 48.

[0038] In the exemplary tamper evident lock base portion 40, the lock base dimple central portion 48 is approximately planar and square with rounded corners, and surrounded by lock base dimple walls 46, forming a crushable dimple 44 that is approximately square with rounded corners. However, this is not necessary, and other shapes and configurations can be

used resulting in a crushable dimple 44 having almost any three-dimensional shape such as a pyramid or cube.

[0039] The floor 30 of the base 22 includes a base floor central portion 60, which preferably includes a base floor recess 61. The base floor recess may be formed to collect liquids, for example salad dressing or juices from meat, to keep at least some separation from those liquids and the food contained in the base 22 and thereby preserve the texture, freshness, and other qualities of the food that might otherwise deteriorate from continuous contact between the liquid and food.

[0040] The base 22 can include base wall embossments 62, for example on the side walls 31. Such base wall embossments may be provided, for example, to improve the rigidity of the base side walls 31, to provide a condensation channel for moisture within the container 20, to provide a gripping surface on the base, or for decorative purposes.

[0041] The base 22 can include a base inner engagement surface 63, which can be used to form a seal between the base 22 and a complementary engagement surface on a cover. The base inner engagement surface 63 includes a base inner engagement surface ridge 64, which can mate with a complementary trough on an engagement surface on a cover.

[0042] The base rim 33 of the base 22 can include a base rim inner wall 65, a base rim top surface 66, and a base rim outer wall 67. A base rim outer flange 68 may be integrally formed with the base rim outer wall 67. The base 22 can include a base handle portion 80, for example as an integrally formed portion of the base rim outer flange 68. Such a base handle portion 80 can be used, for example, as a grip when placing a cover on the base 22 or when removing a cover from the base 22.

[0043] The base 22 can include a base indicia 81, for example as an integrally formed portion of a base handle portion 80. Such a base indicia 81 can be used, for example, to indicate the direction in which the base 22 should be moved when removing a cover from the base 22.

[0044] Fig. 2 is a perspective view of the base 22 of Fig. 1, rotated approximately 180 degrees. As perhaps best shown in Fig. 2, the base 22 can include base sealing threads 90. Each base sealing thread 90 can be formed, for example, to engage with a complementary sealing thread on a cover when the cover is placed on the base and rotated relative to the base to fasten the cover on the base.

[0045] Each base sealing thread 90 can include a base sealing thread engagement wall 91 formed to engage with a complementary sealing thread engagement wall on a cover. The base sealing thread engagement wall 91 can include a taper or inclination, whereby a cover placed on the base may be drawn increasingly tightly onto the base when the cover is rotated relative to the base.

[0046] The base sealing thread 90 can include a forward limit wall 92 to engage with a complementary forward limit wall on a cover, to provide a forward limit to rotation as a cover is rotated relative to the base to fasten the cover on the base. One or more base sealing threads 90 can also include a reverse limit wall 93 to engage with a complementary reverse limit wall on a cover, to prevent inadvertent rotation of a cover that has been fastened on the base 22. Each base sealing thread 90 can include a base sealing thread top wall 94.

[0047] Fig. 3 is a perspective view from above the cover 24 of an exemplary container according to the invention. The cover 24 includes a cover ceiling 34, cover side walls 35 integrally formed with and extending downward from the ceiling 34 to a cover side wall bottom 36, and a cover rim 37. Like the base 22, the cover 24 is preferably made using thermoforming methods from a suitable thermoformable material,.

[0048] The cover 24 includes a tamper evident lock cover portion 50. The tamper evident lock cover portion 50 preferably includes a lock cover tab 51, a lock cover tab fracture portion 52, and a lock cover crushable dimple 54, , although this is not necessary and other types of lock cover portions can be used. The lock cover crushable dimple 54 preferably

includes a lock cover dimple wall 56 and a lock cover dimple central portion 58.

[0049] The ceiling 34 of the cover 24 includes a cover ceiling central portion 70, which preferably includes a cover ceiling protrusion 71. The cover ceiling protrusion 71 can be used, for example, to provide a separation between the cover ceiling and food placed within the container 20.

[0050] The cover 24 can include cover wall embossments 72, for example on the cover side walls 35. Such cover wall embossments may be provided, for example, to improve the rigidity of the cover side walls 35, to provide a condensation channel for moisture within the container 20, to provide a gripping surface for the cover 24, or for decorative purposes.

[0051] The cover rim 37 of the cover 24 can include a cover rim outer wall 76. A cover rim outer flange 77 may be integrally formed with the cover rim outer wall 76.

[0052] The cover 24 can include at least one cover handle portion 83, for example as an integrally formed portion of the cover rim outer flange 77. Such a cover handle portion 83 can be used, for example, as a grip when placing the cover 24 on the base 22 or when removing the cover 24 from the base 22.

[0053] The cover 24 can also include at least one cover indicia 84, for example as an integrally formed portion of a cover handle portion 83. Such a cover indicia 84 can be used, for example, to indicate the direction in which the cover should be moved when removing the cover 24 from the base 22.

[0054] Fig. 4 is a perspective view from below the cover 24 of Fig. 3. As perhaps best shown in Fig. 4, the cover rim 37 of the cover 24 can include a cover rim inner wall 73. The cover rim 37 can include a cover rim inner engagement surface 74 that mates with a complementary base inner engagement surface 63 on a base 22. The inner engagement surface 74 can also include a cover rim inner engagement surface trough 75 mates with a complementary base inner engagement surface ridge 64 on a base inner

engagement surface 63 of a base 22. The cover rim 37 can also have a cover rim outer wall 76.

[0055] As perhaps best shown in Fig. 4, the cover 24 can include cover sealing threads 95 that engage with complementary sealing threads 90 on a base 22 when the cover 24 is placed on the base 22 and rotated relative to the base to fasten the cover on the base. Each cover sealing thread 95 preferably includes a cover sealing thread engagement wall 96 to engage with a complementary base sealing thread engagement wall 91 on a base 22. The cover sealing thread engagement wall 96 can include a taper or inclination, whereby the cover 24 is tightened on the base 22 when the cover is placed on the base and rotated relative to the base.

[0056] One or more of the cover sealing threads 95 can include a forward limit wall 97 to engage with a complementary base forward limit wall 92 on a base 22, providing a forward limit to rotation when the cover 24 is rotated relative to the base 22 to fasten the cover on the base. One or more of the cover sealing threads 95 can include a reverse limit wall 98 to engage with a complementary base sealing thread reverse limit wall 93 on a base 22, inhibiting reverse rotation of the cover 24 after it has been fastened on the base 22. Each cover sealing thread 95 can have a cover sealing thread bottom wall 99.

[0057] Fig. 5 is a perspective view showing the cover 24 positioned above the base 22, with the cover 24 rotated to position the cover sealing threads 95 of the cover 24 above the gaps between the base sealing threads 90 of the base 22.

[0058] Fig. 6 is a perspective view of the cover 24 placed on the base 22 so that the base rim 33 engages with the cover rim 37, thereby forming a container 20 surrounding a chamber 26. In Fig. 6, the cover 24 is in the same rotational position (relative to the base 22) as is shown in Fig. 5. When the cover 24 and the base 22 are at the rotational position shown in Fig. 6, the base sealing thread engagement walls 91 of the base sealing

threads 90 do not engage with the cover sealing thread engagement walls 96 of the cover sealing threads 95.

[0059] Fig. 7 is a perspective view of the cover 24 placed on the base 22 so that the base rim 33 engages with the cover rim 37, thereby forming a container 20 surrounding a chamber 26. In Fig. 7, the cover 24 has been rotated relative to the base 22, in a direction opposite the arrow shown on the cover indicia 84, from the rotational position of Fig. 6 until the cover sealing thread forward limit walls 97 of the cover sealing threads 95 engage the base sealing thread forward limit walls 92 of the base sealing threads 90.

[0060] At the rotational position shown in Fig. 7, the base sealing thread engagement walls 91 of the base sealing threads 90 engage the cover sealing thread engagement walls 96 of the cover sealing threads 95, thereby fastening the cover 24 on the base 22. The base sealing thread engagement walls 91 of the base sealing threads 90 preferably include a taper or inclination relative to the cover sealing thread engagement walls 96, whereby rotating the cover 24 relative to the base 22 presses the rim 37 of the cover 24 against the rim 33 of the base 22, to tightly seal the cover 24 on the base 22.

[0061] At the rotational position shown in Fig. 7, a base sealing thread reverse limit wall 93 of a base sealing thread 90 can engage the cover sealing thread reverse limit wall 98 of a cover sealing thread 95. This can inhibit reverse rotation of the cover 24 (in the direction of the arrow shown in the cover indicia 84) and further secure the cover 24 to the base 22. Engagement of the base sealing thread reverse limit wall 93 with the cover sealing thread reverse limit wall 98 can also provide an audible or tactile “click” to help provide confirmation that the container 20 has been properly closed.

[0062] At the rotational position shown in Fig. 7, the tamper evident lock base portion 40 of the base 22 can align with the tamper evident lock cover portion 50 of the cover 24. In this rotational position, the crushable dimple 44 of the tamper evident lock base portion 40 is preferably positioned

to nest with the crushable dimple 54 of the tamper evident lock cover portion 50.

[0063] Fig. 8 is also a perspective view of the cover 24 placed on the base 22 so that the base rim 33 engages with the cover rim 37, thereby forming a container 20 surrounding a chamber 26. In Fig. 8, the cover 24 is in the same rotational position shown in Fig. 7 (relative to the base 22), and the relative positions of the cover 24 and the base 22 are generally the same as in Fig. 7. However, in Fig. 8, the crushable dimple 44 of the tamper evident lock base portion 40 is nested together with the crushable dimple 54 of the tamper evident lock cover portion 50 to form an unsealed tamper evident lock 38.

[0064] Fig. 9 is also a perspective view of the cover 24 placed on the base 22 so that the base rim 33 engages with the cover rim 37, thereby forming a container 20 surrounding a chamber 26. In Fig. 9, the cover 24 is in the same rotational position shown in Figs. 7-8 (relative to the base 22), and the relative positions of the cover 24 and the base 22 are generally the same as in Figs. 7-8. However, in Fig. 9, the crushable dimple 44 of the tamper evident lock base portion 40 and the crushable dimple 54 of the tamper evident lock cover portion 50 are nested together and crushed to fasten them together and thereby form a sealed tamper evident lock 39.

[0065] The tamper evident lock base portion 40 and the tamper evident lock cover portion 50 are preferably adapted be fastened together to form a sealed tamper evident lock 39 having greater strength and durability than the fracture strengths of the lock base fracture portion 42 and the lock cover fracture portion 52. This can help ensure that the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 cannot be separated without also breaking the lock base fracture portion 42 and/or the lock cover fracture portion 52. Adapting the lock base fracture portion 42 and the lock cover fracture portion 52 to have relatively low fracture strength can also help ensure that a consumer can easily break the lock base fracture portion 42 and the lock cover fracture portion 52 in order to remove

the sealed tamper evident lock 39 from the container and thereby open the container.

[0066] A container according to the invention preferably includes means for providing an appropriate amount of tension between the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 when the two are fastened together (with the cover placed on the base to form a closed container). The tension is preferably in an amount sufficient to help ensure that a fracture in the cover or base fracture portion results in a visible separation along any broken fracture portion. The tension is preferably not so great that excessive numbers of fractures occur accidentally or in the absence of any actual tampering.

[0067] As perhaps best shown in Fig. 9, in the container 20 the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 include tabs that are adapted to have different lengths. This is one means of providing tension between the tamper evident lock base portion 40 and the tamper evident lock cover portion 50, but not the only such means. For example, the tamper evident lock base portion 40 or the tamper evident lock cover portion 50 could include an elastic or pliable portion, or a raised protrusion, a pliable or elastic member or portion, or other convex structure could be placed between the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 when the two are fastened together.

[0068] In the container 20 of Fig. 9, the sealed tamper evident lock 39 inhibits any reverse rotation of the cover 24 (in the direction of the arrow shown in the cover indicia 84) relative to the base 22, thereby securing the cover 24 to the base 22. Further, the sealed tamper evident lock 39 cannot easily be separated into its tamper evident lock base portion 40 and tamper evident lock cover portion 50 (to allow the cover 24 to be removed from the base 22) without breaking or damaging the lock base fracture portion 42 and/or the lock cover fracture portion 52. Thus, either the seller or a prospective purchaser of a product, such as ready-to-eat food, placed in the chamber 26 of the container 20 can inspect the sealed tamper evident lock

39, the lock base fracture portion 42, and the lock cover fracture portion 52 for indications of tampering before the product is sold or consumed.

[0069] Fig. 10 is also a perspective view of the cover 24 placed on the base 22 so that the base rim 33 engages with the cover rim 37, thereby forming a container 20 surrounding a chamber 26. In Fig. 10, the cover 24 is in the same rotational position shown in Figs. 7-9 (relative to the base 22), and the relative positions of the cover 24 and the base 22 are generally the same as in Figs. 7-9. However, in Fig. 10, the sealed tamper evident lock 39 has been separated from the base 22 along the lock base fracture portion 42 and separated from the cover 24 along the lock cover fracture portion 52.

[0070] After removal of the sealed tamper evident lock 39, the cover 24 can be rotated (relative to the base 22) in the direction indicated by the cover indicia 84 back to the rotational position shown in Fig. 6, disengaging the cover sealing threads 95 from the base sealing threads 90 to allow the cover 24 to be removed from the base 22, thereby opening the chamber 26 to provide access to the product stored therein. Advantageously, the container 20 is reclosable by rotating the cover back from the rotational position shown in Fig. 6 to the rotations position shown in Figs. 7-10, thereby engaging the cover sealing threads 95 with the base sealing threads 90 to refasten the cover 24 on the base 22.

[0071] When removing the cover 24 from the base 22 by rotating the cover 24 in the direction indicated by the cover indicia 84 back to the rotational position of Fig. 6, rotational force may be necessary to overcome the inhibition of reverse rotation resulting from the engagement of the cover reverse limit wall 98 with the base reverse limit wall 93. The magnitude of the necessary rotational force can be adjusted in a variety of ways. For example, the shapes or heights of the cover reverse limit wall 98 or of the base reverse limit wall 93 (or both) can be adjusted. The number of base sealing threads 90 that include a base reverse limit wall 93 or the number of cover sealing threads 95 that include a cover reverse limit wall 98

can be adjusted. The pliability or thickness of the materials used to form the cover reverse limit wall 98 or the base reverse limit wall 93 (or both) can also be adjusted.

[0072] Fig. 11 is a perspective view from above the base 122 of another exemplary container 120 according to the invention. Like the base 22 and the cover 24 of the container 20, the base 122 is preferably made using thermoforming methods from a suitable thermoformable material of the types discussed above.

[0073] The base 122 includes a floor 130 having a central portion 131. The floor 130 can include floor side edges 132 with base side walls 133 integrally formed with and extending upward from the floor side edges 132 of the base floor 130. The floor 130 can have a floor front edge 135, with a base front end wall 137 integrally formed with and extending upward from the floor front edge 135 of the base floor 130. The floor 130 can include a base floor rear edge 138.

[0074] The base 122 preferably includes a tamper evident lock base portion 40. The tamper evident lock base portion 40 can include a lock base tab 41 integrally formed with and connected to the base floor rear edge 138 by a lock base tab fracture portion 42. The tamper evident lock base portion 40 can include two lock base crushable dimples 44, each lock base crushable dimple 44 having a lock base dimple wall 46 and a lock base dimple central portion 48. The tamper evident base portion 40 preferably also includes a convex tensioning protrusion 49 extending upward from the tamper evident lock base portion 40.

[0075] The tamper evident lock base portion 40 may include an adhesive-bearing surface 47, comprising any adhesive of the types known in the art, although this is not required. The adhesive-bearing surface 47 may include only one component of an adhesive, such as an epoxy resin, for use with a surface bearing a complementary component, such as an epoxy hardener. The adhesive-bearing surface 47 may be formed of a material that

melts or becomes adhesive when subjected to heat, radio frequency energy, or microwave radiation, including the thermoplastic forming the base itself.

[0076] Each base side wall 133 can include an integrally formed base side sealing slot 150. Each base side sealing slot 150 preferably includes a base side sealing slot engagement wall 152 formed to engage with a complementary side sealing ridge engagement wall on a cover. The base side sealing slot engagement wall preferably includes a taper or inclination whereby a cover is tightened on the base 122 when the cover is engaged with the base 122.

[0077] Each base side sealing slot 150 can include a base side sealing slot forward limit wall 153 formed to engage with a complementary side sealing ridge forward limit wall on a cover, to provide a forward limit as the cover is engaged on the base 122 to fasten the cover on the base 122.

[0078] Each base side sealing slot 150 can also include a base side sealing slot reverse limit wall 154 formed to engage with a complementary side sealing ridge reverse limit wall on a cover, to inhibit removal of a cover that has been fastened on the base 122.

[0079] Each base side sealing slot 150 can have a base side sealing slot open end 155 adjacent to the side portions of the base floor rear edge 138. Each base side sealing slot 150 can have a base side sealing slot bottom wall 156.

[0080] The base front end wall 137 can include an integrally formed base front sealing slot 157. The base front sealing slot 157 preferably includes a base front sealing slot engagement wall 158 formed to engage with a complementary front sealing ridge engagement wall on a cover.

[0081] Fig. 12 is a perspective view from below the base 122 of Fig. 11, providing additional illustration of the structure of the base 122.

[0082] Fig. 13 is a perspective view from above a cover 124 formed to engage with the base 122 of Figs. 11-12 to form another exemplary container 120 according to the invention. Like the base 122 of container 120

and the base 22 and the cover 24 of the container 20, the cover 124 is preferably made from a suitable thermoformable material using thermoforming methods.

[0083] The cover 124 can include a cover chamber ceiling 140 having a cover chamber ceiling central portion 141 and cover chamber walls 142 integrally formed with and extending downward from the cover chamber ceiling 140.

[0084] Cover side flanges 143 can be integrally formed with and extend outward from the side portions of the cover chamber walls 142. Cover side rims 144 can be integrally formed with and extend upward and outward from the cover side flanges 143.

[0085] A cover front flange 146 can be integrally formed with and extend outward from the front portion of the cover chamber walls 142. A cover front rim 147 can be integrally formed with and extends upward and outward from the cover front flange 146. A cover rear flange 148 can be integrally formed with and extend outward from the rear portion of the cover chamber walls 142 to a cover rear edge 149.

[0086] The cover 124 preferably includes a tamper evident lock cover portion 50. The tamper evident lock cover portion 50 can include a lock cover tab 51 integrally formed with and connected to the cover rear edge 149 by a lock cover tab fracture portion 52. Each tamper evident lock cover portion 50 preferably includes two lock cover crushable dimples 54, each lock cover crushable dimple 54 having a lock cover dimple wall 56 and a lock cover dimple central portion 58.

[0087] Each cover side rim 144 can include an integrally formed cover side sealing ridge 160 that is formed to be inserted into a complementary side sealing slot 150 to fasten the cover 124 on a base 122. Each cover side sealing ridge 160 can include a cover side sealing ridge engagement wall 162 formed to engage with a complementary base side sealing slot engagement wall 152 when the cover side sealing ridge 160 is inserted into a base side sealing slot 150. The cover side sealing ridge

engagement wall 162 preferably includes a taper or inclination whereby the cover 124 is tightened on the base 122 when the cover 124 is engaged with the base 122.

[0088] Each cover side sealing ridge 160 can include a forward limit wall 163 formed to engage with a complementary forward limit wall 153 on a base side sealing slot 150, to provide a forward limit to insertion as the cover side sealing ridge 160 is inserted into the base side sealing slot 150.

[0089] Each cover side sealing ridge 160 can include a reverse limit wall 164 formed to engage with a complementary reverse limit wall 154 on a base side sealing slot 150. The reverse limit wall 164 may be located near the cover side sealing ridge rear end 165, but this is not required.

[0090] Engagement of the cover reverse limit wall 164 with the complementary base reverse limit wall 154 can help to inhibit withdrawal of the cover side sealing ridge 160 from the base side sealing slot 150, and thereby inhibit removal of the cover 124 from the base 122 after the cover 124 has been fastened on the base 122. Engagement of the cover reverse limit wall 164 with the complementary base reverse limit wall 154 can also provide an audible or tactile “click” to help provide confirmation that the container 120 has been properly closed.

[0091] The cover front rim 147 can include a cover front sealing ridge 167 formed to be inserted into a complementary base front sealing slot 157. The cover front sealing ridge 167 can have a cover front sealing ridge engagement wall 168 formed to engage with a complementary base front sealing slot engagement wall 158 when the cover front sealing ridge 167 is inserted into the base front sealing slot 157 as the cover 124 is fastened on the base 122.

[0092] Fig. 14 is a perspective view from below the cover 124 of Fig. 13, providing additional illustration of the structure of the cover 124. As perhaps best shown in Fig. 14, each cover side sealing ridge 160 may have a cover side sealing ridge bottom wall 166.

[0093] As perhaps best shown in Fig. 14, tamper evident lock cover portion 50 may include an adhesive-bearing surface 57, comprising any adhesive of the types known in the art, although this is not required. The adhesive-bearing surface 57 may include only one component of an adhesive, such as an epoxy resin, for use with a surface bearing a complementary component, such as an epoxy hardener. The adhesive-bearing surface 57 may be formed of a material that melts or becomes adhesive when subjected to heat, radio frequency energy, or microwave radiation, including the thermoplastic forming the cover itself.

[0094] Fig. 15 is a perspective view of the cover 124 of Figs. 13-14 and the base 122 of Figs. 11-12, where the cover 124 is positioned to be fastened on the base 122 by inserting the cover side sealing ridges 160 into the open ends 155 of the base side sealing slots 150.

[0095] As perhaps best shown in Fig. 15, the convex tensioning protrusion 49 is preferably adapted to be placed between the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 when the two are fastened together, as a means of providing tension between the tamper evident lock base portion 40 and the tamper evident lock cover portion 50. As previously discussed, this tension can help create a visible separation along the lock base fracture portion 42 and/or the lock cover fracture portion in the event of any tampering.

[0096] Other means for providing tension between the lock base portion 40 and the lock cover portion 50 can also be used, alone or in combination. For example, an elastic portion or a difference in lengths between the lock base portion 40 and the lock cover portion 50 could be used to provide this tension. Further, the convex tensioning protrusion 49 could have a different shape, a tensioning protrusion could be provided on the lock cover portion 50 instead of or in addition to a tensioning protrusion on the lock base portion 40, or multiple tensioning protrusions could be used.

[0097] Fig. 16 is a perspective view of the cover 124 of Figs. 13-14 fastened on the base 122 of Figs. 11-12 to form another exemplary

container 120 having a chamber 126. When the base 122 and cover 124 are positioned as in Fig. 16, the cover side sealing ridges 160 have been fully inserted into the base side sealing slots 150, whereby the forward limit walls 163 of the cover 124 engage the forward limit walls 153 of the base 122 to prevent any further insertion.

[0098] In this position, the cover side sealing ridge engagement walls 162 engage the base side sealing slot engagement walls 152, sealing the cover side rim 144 to the base side wall 133. Also in this position, the cover front sealing ridge 167 is inserted into the base front sealing slot 157, engaging the cover front sealing ridge engagement wall 168 with the base front sealing slot engagement wall 158 and sealing the cover front rim 147 to the base front end wall 137.

[0099] In Fig. 16, the reverse limit walls 164 of the cover 124 are engaged with the reverse limit walls 154 of the base 122, thereby inhibiting removal of the cover side sealing ridges 160 from the base side sealing slots 150 and inhibiting removal of the cover 124 from the base 122.

[0100] When the base 122 and cover 124 are positioned as in Fig. 16, the tamper evident lock base portion 40 and the tamper evident lock cover portion 50 can be aligned, and the lock base crushable dimple 44 and the lock cover crushable dimple 54 can be nested, as shown in Fig. 16, to form an unsealed tamper evident lock 38.

[0101] Like Fig. 16, Fig. 17 is a perspective view of the cover 124 of Figs. 13-14 placed on the base 122 of Figs. 11-12 to form another exemplary container 120 having a chamber 126. In Fig 17, however, the lock base dimples 44 of the tamper evident lock base portion 40 and the lock base dimples 54 of the tamper evident lock cover portion 50 have been nested and crushed together to form a sealed tamper evident lock 39.

[0102] In the container 120 of Fig. 17, the sealed tamper evident lock 39 inhibits any removal of the cover side sealing ridges 160 from the base side sealing slots 150, thereby inhibiting removal of the cover 124 from the base 122. Further, the sealed tamper evident lock 39 cannot easily

be separated into its tamper evident lock base portion 40 and tamper evident lock cover portion 50 (to allow the cover 24 to be removed from the base 22) without breaking or damaging the lock base fracture portion 42 and/or the lock cover fracture portion 52. Thus, either the seller or a prospective purchaser of a product, such as ready-to-eat food, placed in the chamber 126 of the container 120 can inspect the sealed tamper evident lock 39, the lock base fracture portion 42, and the lock cover fracture portion 52 for indications of tampering before the product is sold or consumed.

[0103] Fig. 18 is also a perspective view of the cover 124 of Figs. 13-14 placed on the base 122 of Figs. 11-12 to form another exemplary container 120 surrounding a chamber 126. In Fig. 18, the relative positions of the cover 124 and the base 122 are generally the same as in Figs. 16-17. However, in Fig. 18, the sealed tamper evident lock 39 has been separated from the base 122 along the lock base fracture portion 42 and separated from the cover 124 along the lock cover fracture portion 52.

[0104] After removal of the sealed tamper evident lock 39, the cover side sealing ridges 160 may be withdrawn from the base side sealing slots 150, to disengage the cover side sealing ridge engagement walls 162 from the base side sealing slot engagement walls 152 and allow the cover 124 to be removed from the base 122, thereby opening the chamber 126 to provide access to the product stored therein. Advantageously, the container 120 is reclosable by sliding the cover 124 back onto the base 122 to thereby fasten the cover on the base.

[0105] When withdrawing the cover side sealing ridges 160 from the base side sealing slots 150, to place the cover 124 and base 122 in the position shown in Fig. 15, some degree of force may be necessary to overcome the engagement of the cover side sealing ridge reverse limit wall 164 with the base side sealing slot reverse limit wall 154. The magnitude of the necessary force can be adjusted in a variety of ways. For example, the shapes or heights of the cover side sealing ridge reverse limit wall 164 or of the base side sealing slot reverse limit wall 154 (or both), or the number of

base side sealing slot reverse limit walls 154 and cover side sealing ridge reverse limit walls 164 can be adjusted. The pliability or thickness of the materials used to form the base side sealing slot reverse limit walls 154 and the cover side sealing ridge reverse limit walls 164 can also be adjusted.

[0106] Fig. 19 is a perspective view of an alternative container according to the invention, indicated generally at 170. The container 170 has a base 172, similar to the base 122 of container 120 of Figs. 11-12 and 15-18. The container 170 has a cover 174, similar to the cover 124 of container 120 of Figs. 13-18. Like the base 122 and cover 124 of container 120 and the base 22 and cover 24 of container 20, the base 172 and cover 174 of container 170 are preferably made using thermoforming methods from a suitable thermoformable material.

[0107] Like the container 120 of Fig. 16, the container 170 of Fig 19 includes an unsealed tamper evident lock 38 having a lock base portion and a lock cover portion that are engaged but not crushed together. The lock base portion and lock cover portion of the unsealed tamper evident lock 38 may be crushed together, and thereby fastened together, to form a sealed tamper evident lock 39. The container 170 includes fracture portions 176, which can be broken to remove the tamper evident lock from the container 170. After the tamper evident lock has been removed from the container 170, the cover 174 may be separated from the base 172 to open the container 170.

[0108] There are various possibilities with regard to alternative embodiments of a container according to the invention.

[0109] Although the tamper evident locks of the exemplary containers disclosed herein may include crushable dimples that may be crushed together and thereby permanently fastened together, other types of sealable tamper evident locks may be used. For example, instead of or in addition to crushable dimples, a tamper evident lock base portion bearing an adhesive material and/or a tamper evident lock cover portion bearing an adhesive material could be used. Similarly, a tamper evident lock base

portion bearing or comprising a first material and/or a tamper evident lock cover portion bearing or comprising a second material could be used, where the first material and the second material adhere when pressed or contacted together. A tamper evident container according to the invention could include a tamper evident lock base portion and a tamper evident lock cover portion that are adapted to be placed together and then fastened together using heat, radio-frequency radiation, microwave radiation, or the like.

[0110] The tamper evident lock base portion and cover portion can also be located in different positions. For example, the tamper evident lock base portion and/or the tamper evident lock cover portion may be integrally formed and located on the base rim and cover rim, respectively. The tamper evident lock base portion and/or the tamper evident lock cover portion may be surrounded by fracture portions on a portion of the base and/or cover instead of being placed on tabs attached to the base and cover by fracture portions.

[0111] Although the tamper evident locks of the exemplary containers disclosed herein may include one or more crushable dimples having a specific shape or configuration, other shapes and configurations may be used. For example, a greater number of crushable dimples may be used. The crushable dimples may also be located in different positions, for example crushable dimples may be integrally formed and located on the base rim and cover rim. The crushable dimples may be surrounded by fracture portions on a portion of the base and/or cover instead of being placed on tabs attached to the base and cover by fracture portions.

[0112] Although the exemplary containers disclosed herein show tamper evident locks having a lock cover portion with a crushable dimple that nests within a crushable dimple of a lock base portion, other configurations can be used. For example, the lock base portion and lock cover portion dimples could be reversed, with the dimple of the lock base portion nesting within the dimple of a lock cover portion. Similarly, the lock base portion and lock cover portion could each include multiple crushable

dimples or portions of dimples, for example with a first pair of dimples having a base dimple nesting in a cover dimple and a second pair of dimples having a cover dimple nesting in a base dimple.

[0113] Although the fracture portions in the exemplary containers disclosed herein are formed as perforations, other methods can be used to form the fracture portions. For example, narrowed portions of a tab, scored lines, sections made of thinner material, or sections made of alternate materials having lesser strength or rigidity can be used to form fracture portions.

[0114] The cover and base of a container according to the invention can have various design features that are conventional in thermoformed containers, for example side walls that slope inward from the base rim to the base floor to facilitate removal of the formed part from the mold and nestable stacking of a plurality of bases. Similarly, the cover may have side walls that slope outward from the ceiling to the cover rim to facilitate removal of the formed part from the mold and allow nestable stacking of a plurality of covers.

[0115] A container according to the invention can include materials having any color or combination of colors, and these materials can be opaque, translucent, or transparent, depending on the application.

[0116] A container according to the invention can include a base formed from a material of one color with a cover formed from a material of a different color. For example, the cover could be formed of a transparent and clear material, while the base could be formed of an opaque and black material. By forming the cover from clear material, a consumer can view the container's contents without opening the container and thereby allowing heat to escape or contaminants to enter. By forming the base of opaque black material, the consumer will not ordinarily view moisture or excess fat that may have collected at the bottom of the container.

[0117] Although a base and container according to the invention disclosed herein includes a base side sealing slot and a cover side

sealing ridge, other means can be used to seal the cover to the base to form a container according to the invention. For example, the positions of the slot and the ridge could be reversed, whereby the base side wall could include a ridge and the cover side rim could include a slot. Similarly, the base side walls and cover side rims could each include a combination of slots and ridges, configured in a complementary fashion to form an interference fit between the base and the cover. Further, although a specific configuration of base side sealing slots and cover side sealing ridges are described, a variety of other structures can be used to form a seal or interference fit between the cover and the base, such as a plurality of spaced interference projections and troughs, formed edges, overlapping edges, and the like.

[0118] Although the exemplary containers include specific patterns of floor, ceiling, and wall embossments, these embossments can be formed in any pattern desired. Such embossments can be formed to extend into the container, or they can be formed to extend outward from the container. Floor, ceiling, or side wall embossments can be used for ornamental purposes, and they can also be used to strengthen and increase the rigidity of the structures on which they appear, thereby allowing these structures to be manufactured using thinner material than could otherwise be used.

[0119] Floor recesses or protrusions in particular can provide a number of benefits. For example, floor embossments can provide a surface upon which food can be placed within the container. Floor embossments extending upward from the floor can support the food away from any drippings from sauce, condensation, or grease from the food, and thereby help to maintain the freshness of the food. Alternatively, floor recesses extending downward from the floor can provide wells for collection of the fluids emitted from the food product.

[0120] Either the base or the cover or both can include one or more vents configured to allow steam to escape from a container according to the invention. Excess steam built up in such a container can saturate the food

product stored within, rendering the food product soggy. Accordingly, vents can be provided in a suitable size and shape to allow excess moisture to escape while preserving the temperature inside the container.

[0121] Either the base or the cover or both can include one or more integrally formed dividing walls extending into the chamber. Such dividing walls can be used, for example, to subdivide the container into separate sections for separate foods or components of foods, such as a pasta and a sauce, to prevent mixture of the contents of the separate sections, for example if the container is turned on its side or inverted.

[0122] The floor of the base may be a convex shape such that the centermost point of the floor extends outward from the chamber, thereby effectively increasing the volume of the container. Alternatively, the floor may have a concave shape such that the center point of the floor extends upward into the chamber, thereby effectively decreasing the volume of the container. Forming the floor in a concave or convex shape can have the advantage of collecting fluid emitted from a food product, either along the periphery of the floor (when the center portion of the floor extends upward into the container) or at the center point of floor (when the center portion of the floor extends downward from the container). When fluid is collected in a center point of the floor, a well can be placed at the center point to collect the fluid and maintain the fluid separate from the food product placed within the container. Forming the floor in a concave shape can also provide an indentation for improved stackability of multiple containers according to the invention, so that the cover of a first container can nest into an indentation in the floor of the base of a second container stacked on top of the first container.

[0123] It is understood that the invention is not confined to the particular embodiments set forth herein as illustrative, but embraces all such forms thereof as come within the scope of the following claims.